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(54) 【発明の名称】 粉 体

(57) 【要約】

【課題】 吸湿に伴う各種劣化を抑制された粉末の提供。

【解決手段】 固有の水分値Aより水分値Bが5%以上高い成分を乾重量当たり3重量%以上90重量%以下の範囲で含み、さらに湿重量当たり40重量%より少ない水分量を含むことを特徴とする粉体。

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【特許請求の範囲】

【請求項1】 固有の水分値A（25℃、過飽和水蒸気雰囲気における平衡水分）より水分値B（25℃におけるガラス転移水分）が5重量%以上高い成分を乾重量当たり3重量%以上90重量%以下の範囲で含み、さらに湿重量当たり40重量%より少ない水分量を含むことを特徴とする粉体。

【請求項2】 粉体がパン粉及び／又はパン粉様物である請求項1記載の粉体。

【請求項3】 粉体がアミノ酸、ペプチド及び／又はそれらの塩を1種類以上含有する請求項1記載の粉体。

【請求項4】 粉体がアミノ酸、ペプチド及び／又はそれらの塩を1種類以上含有する粉末調味料である請求項1記載の粉体。

【請求項5】 前記水分値Aより前記水分値Bが5重量%以上高い成分が寒天、カラギーナン、動物性筋肉タンパク質、血液アルブミン、血液グロブリン、架橋澱粉、ツェイン、トランスグルタミナーゼ処理タンパク質のうちから選ばれる1種類以上である請求項1、2、3又は4に記載の粉体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は吸湿、あるいはその後の固結により品質が変化する性質を改善した粉体に関するものである。

【0002】

【従来の技術】 粉末製品は、広く食品、ファインケミカル等の分野で見られ、それらが吸湿することによる品質変化は、各業界における克服すべき大きな問題となっている。例えば粉末調味料は吸湿によりベタつきを生じ、その後軟化、収縮、固結等外観変化を起こすと共に、流動性、溶解性の低下等の物性変化、さらに酸化、褐変反応等の進行による色、味、風味の劣化を引き起こす。また、生理活性物質についても吸湿により粉末が軟化し、粘性の性状を示すようになり、その結果、酸化、褐変、変性反応等の進行による著しい活性低下が起こる。このように、粉体の吸湿は大幅な商品価値の低下をもたらす。

【0003】 一方、吸湿による劣化は特に化学的な変化が起こらずとも問題となっており、パン粉、粉末状スナック菓子等も吸湿によりサクサク感が失われ、商品価値を損なう。

【0004】 この様な問題を克服するために、従来、水蒸気不透過性包材で包装する方法の他、冷蔵、冷凍保存する方法等が用いられてきたが、包装方法の場合は開封することによって、また冷蔵、冷凍法の場合には常温に戻せば当然効果はなくなるため、用途制限があることに加えて、コスト増等の問題があった。また、粉体に油あるいは界面活性剤を含有せしめる方法（例えば、特開昭52-130932号公報）、大豆タンパク質（例え

ば、特開昭56-11771号公報）や熱凝固性タンパク質（例えば、特開平2-2313号公報）等のタンパク質を含有せしめる方法、コンニャク粉（例えば、特開昭62-74255号公報）、セルロース（例えば、特開昭63-245649号公報）、カルボキシメチルセルロースのナトリウム塩（例えば、特開平2-211833号公報）等の多糖を含有せしめる方法等により抑える試みもなされてきた。しかし、何れの方法の場合も無添加に比べれば吸湿による劣化は抑制できるものの、充分な効果を得るためには添加物を数十重量%と多量に含有せしめる必要があるため、本来の味、風味、食感に著しい変化をきたしたり、溶解性を低下させることがあって実用化にはまだ問題があり、充分な解決策となっていない。

【0005】 この様な状況の中、合成高分子の分野で長年研究されてきた非晶性アモルファス物質のガラス転移の理論を、食品、生体高分子に応用した研究が進み、例えば澱粉、デキストリン等の非晶性の粉末の吸湿に伴う軟化は、それら高分子に対する水の可塑剤としての効果により、弾性的粘弾性体であるガラス状態から粘性的粘弾性体であるラバー状態への状態変化であり、この変化により様々な劣化反応が始まること等が明かとなってきた（例えば、Slade, L. らの報文：CRC Crit. Rev. Food Sci. Nutr., Vol. 30, p. 115, Karmas, R. らの報文：J. Agric. Food Chem., Vol. 40, p. 873）。

【0006】 また、固体全体のガラス転移温度の上昇に伴い上昇する同じ温度におけるガラス転移水分の上昇に着目することにより、クッキーのサクサク感を一定の吸湿処理後も維持できること等も報告されてきた（例えば、Slade, L. らの報文：J. Sci. Food Agric., Vol. 63, p. 133）。これは、Couchman-Karasch 式（例えば、Kalichevsky, M. T. らの報文：Carbohydr. Polym., Vol. 19, p. 271 に記載）にあるように多成分混合物のガラス転移点は、各成分のガラス転移温度に構成比をかけたものの総和で決まるとされており、ガラス転移点のより高い成分を、より多く含有せしめることが固体全体のガラス転移点を上げることになることに基づいたものである。しかしながら、これは主成分である小麦粉よりガラス転移の高い物質を添加するのではなく、副成分で小麦粉よりガラス転移温度の低いシュクロース等を減らす方法であり、大きな効果が期待できない上、応用できる製品範囲もせまいものであった。現在まで、小麦粉の最大構成成分である澱粉関連物質より、ガラス転移温度が大幅に高い可食性成分の報告は無いことから、ガラス転移温度の高い成分のみの添加による問題の解決はむづかしい。

【0007】

【発明が解決しようとする課題】 本発明は吸湿、あるいはその後の固結により品質が変化する粉体の品質改善を目的とするものであり、吸湿によってもその色、味、風味、食感等に影響無く、吸湿に伴う品質低下の抑制され

た粉体を提供することを目的とするものである。

【0008】

【課題を解決するための手段】本発明者らは、上記課題を解決すべく鋭意検討を重ねた結果、たとえばガラス転移温度が高い成分であっても、ある一定水蒸気圧条件での平衡水分が低い成分でなければ、粉体に含有せしめた場合に吸湿に起因する悪影響を防止する十分な効果が得られないことを見だし、さらに室温（25℃）における固有の水分値A（過飽和水蒸気雰囲気における平衡水分）より水分値B（ガラス転移水分）が高ければ高いほど粉体に含有せしめた場合に吸湿による軟化を防ぐ効果が大きいことを見出した。

【0009】そこで、水分値B－水分値Aが高い成分を数百種類の多糖類、タンパク質類の中からスクリーニングした結果、各種寒天、数種のカラギーナン、筋肉タンパク質、血液アルブミン、血液グロブリン、数種の架橋澱粉、ジアルデヒドスターチ、ツェイン、エラスチン、カードラン、数種のトランスグルタミナーゼ処理タンパク質等が高い値を示すことを見出した。さらに、実際に乾重量当たり3重量%以上90重量%以下の範囲でこれらの成分を粉体に含有せしめたところ、その水分が40重量%より少ない場合には上記課題が解決できることを確認し、本発明を完成させるに至った。

【0010】本発明の第一は固有の水分値A（25℃、過飽和水蒸気雰囲気における平衡水分）より水分値B（25℃におけるガラス転移水分）が5重量%以上高い成分を乾重量当たり3重量%以上90重量%以下の範囲で含み、さらに湿重量当たり40重量%より少ない水分量を含むことを特徴とする粉体に存する。

【0011】本願発明の第二は、粉体がパン粉及び／又はパン粉様物である本発明の第一に記載の粉体に存する。本願発明の第三は、粉体がアミノ酸、ペプチド及び／又はそれらの塩を1種類以上含有する本発明の第一に記載の粉体に存する。本願発明の第四は、粉体がアミノ酸、ペプチド及び／又はそれらの塩を1種類以上含有する粉末調味料である本発明の第一に記載の粉体に存する。本願発明の第五は、前記水分値Aより前記水分値Bが5重量%以上高い成分が寒天、カラギーナン、動物性筋肉タンパク質、血液アルブミン、血液グロブリン、架橋澱粉、ツェイン、トランスグルタミナーゼ処理タンパク質のうちから選ばれる1種類以上である前記本発明の第一～第四に記載の粉体に存する。

【0012】

【発明の実施の形態】本発明において、粉体に添加する成分の固有の水分値Aとは、25℃、過飽和水蒸気雰囲気における平衡水分のことであり、25℃で過飽和水蒸気を1.6リットル/分で送り込んでいるデシケーター中に各成分の約10重量%溶液あるいは懸濁液の凍結乾燥後の粗粉砕物を置き、20時間超えた程度で重量が平衡に達したところで取り出し、その重量における105

℃、20時間乾燥した前後の重量変化から求められる水分の組成比（重量%）を求めたものである。

【0013】また本発明において粉体に添加する成分の固有の水分値Bとは、25℃におけるガラス転移水分のことであり、各成分の前記凍結乾燥粗粉砕物を水蒸気を用いて種々の水分値に吸湿、調製した後、各々のガラス転移温度を示差走査熱量計（以下、DSC）にて測定した結果から、ガラス転移温度の水分依存のグラフを作成し、その曲線から求められる25℃における各成分のガラス状態からラバー状態に変わる水分値（重量%）である。尚、水分値A、水分値Bを25℃の値に設定したのは、粉体の流通は一般に、常温で流通、保管される場合が多いため、この状態で吸湿・劣化しやすいかどうかの指標とするためである。

【0014】本発明において好ましい成分は、その成分固有の水分値Aより水分値Bが大きいものである。粉体の主構成成分としてよく用いられる小麦澱粉、及びその分解物であるデキストリンは、その固有の水分値Bから水分値Aを引いた値が－15重量%以上、1重量%以下の間にあって、水分値差が小さいことから、添加成分の水分値差がこの範囲に近ければ効果は低い。それ故、水分重量%として5重量%以上の差がある成分が好ましく、この差が大きいものであれば大きいものであるほどさらに好ましい。

【0015】具体的物質としては、水分値Bが水分値Aより5重量%以上高いものであれば特に限定されないが、可食性成分であることが好ましく、各種寒天、数種のカラギーナン、筋肉タンパク質、血液アルブミン、血液グロブリン、数種の架橋澱粉、ジアルデヒドスターチ、ツェイン、エラスチン、カードラン、数種のトランスグルタミナーゼ処理タンパク質等が好ましい。但し、水溶性の低い成分では、他のアモルファス共存成分と混練した場合、均一なマトリックス構造が作りにくい場合も多く、他の成分のガラス転移点を引き上げる効果に欠けるため、これらのうち水溶性である各種寒天、数種のカラギーナン、筋肉タンパク質、血液アルブミン、血液グロブリン、数種の架橋澱粉、数種のトランスグルタミナーゼ処理タンパク質等が特に好ましい。また、これらは各々単独で含有せしめても、他の成分と併せて含有せしめても良く、組み合わせも特に限定されるものではない。

【0016】本発明において粉体に含まれる、固有の水分値Aより水分値Bが5重量%以上高い成分の含有比率は、少なすぎれば効果が低く、多すぎれば粉末製品本来の食感、風味、流動性に著しい変化を起こすため、乾重量当たり3重量%以上90重量%以下の範囲で含むことが好ましい。さらに好ましくは含有比率は、含有せしめる成分の効果、改良しようとする粉末製品の特性等により異なるが、当業者であれば容易に設定できる。

【0017】本発明において、粉末に含まれる水分は湿

重量として40重量%以下である。40重量%を超えた場合、固有の水分値Aより水分値Bが5重量%以上高い成分の添加効果ははっきりしなくなるため、これ以下の水分であることが好ましい。

【0018】本発明における粉体は、特に限定されるものでなく、吸湿により品質の変化するパン粉、或いはその類似物、又は吸湿、或いはその後の固結により品質の変化する粉末調味料、粉末ジュース、粉末スープ、粉末コーヒー、粉末状乳製品その他、糖類、塩類、有機酸類あるいはその塩、アミノ酸類あるいはその塩、ペプチド、タンパク質等を1種以上含む食品用、医薬用、飼料用、化学薬品製剤の何れも含まれる。また、粉体は、その粒径、形状により効果が大きく変わるものでなく、任意の粒径、形状であってもよいし、さらに、粉末化のための乾燥法、粒状化法によっても大きく影響を受けないので、任意の製造方法によって得られたものであってもよい。また、本発明における粉体は、前記水分値差が大きい成分により被覆された粉体も含む。

【0019】本発明において用いることのできる好ましい成分である寒天は、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではなく、主原料の藻類の種類、抽出法、精製法、処理法の種類にかかわらず、何れも利用可能である。寒天にはその原料、製法により種々の特性を有するものが知られているが、本発明における粉体への添加成分としての寒天は、一般に寒天のゼリー強度が高い程、固有の水分値AとBの差が大きく、粉体に含有せしめた場合の単位重量当たりの効果は高い傾向にある。ゼリー強度が高い寒天は一方で粘度が高く加工特性、ハンドリング性が悪い難点がある。そのため、ハンドリング特性、加工特性を重視する場合には、酸あるいは酵素により低分子に分解されたもの、あるいは硫酸化等の化学修飾が施されたもの等、低ゼリー強度の寒天が好ましい場合もある。

【0020】例えば、寒天を含有せしめたパン粉を製造するためのドウを調製する場合、高ゼリー強度の寒天では粘度が高く小麦粉との混合が容易でない上、調製したドウが発酵によって十分に膨らまない場合がある。しかし、低ゼリー強度の寒天を用いれば、単位添加量当たりの効果は若干低くなるものの、良好な特性を備えたドウの調製が容易である。このように、寒天の場合、含有せしめる粉体毎に好ましい寒天の種類があると考えられるが、当業者であれば、それぞれの対象粉体食品に適する性質を有する寒天の種類を選定することは容易である。

【0021】本発明に用いることのできるカラギーナンは、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではなく、主原料の藻類の種類、抽出法、精製法、処理法の種類、塩の種類にかかわらず、何れも利用可能である。

【0022】本発明に用いることのできる動物性筋肉タンパク質は、固有の水分値Bが水分値Aより5重量%以

上であれば特に限定されるものではなく、甲殻類等の無脊椎動物から、魚類、ほ乳類等の脊椎動物まで何れの動物の筋肉タンパク質も含まれる。また、この範囲内であれば、使用に際しての筋肉タンパク質の調製方法、精製度合いは効果の有無に影響しない。

【0023】本発明に用いる血液アルブミン、血液グロブリンは、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではなく、甲殻類等の無脊椎動物から、魚類、ほ乳類等の脊椎動物まで何れの動物のものも含まれる。また、この範囲内であれば、使用に際しての血液アルブミン、血液グロブリン各々の調製方法、精製度合いは粉体への添加効果の有無に影響しない。

【0024】本発明に用いることのできる架橋澱粉は、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではなく、何れの澱粉原料のものも含まれ、またこの水分値差の向上のための架橋処理方法も限定されない。

【0025】本発明に用いることのできるツェインは、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではなく、主原料のとうもろこしの種類、抽出法、精製法、処理法の種類にかかわらず、何れも利用可能である。

【0026】本発明に用いることのできるトランスグルタミナーゼ処理タンパク質は、固有の水分値Bが水分値Aより5重量%以上であれば特に限定されるものではない。トランスグルタミナーゼの起源、調製方法及び精製度、トランスグルタミナーゼ処理するタンパク質の種類、タンパク質をトランスグルタミナーゼ処理する場合の酵素濃度、タンパク質の状態、反応時間、共存物の種類等の処理条件も特に限定されるものではない。しかしながらトランスグルタミナーゼによるタンパク質の架橋反応が進行し過ぎると、タンパク質は不溶化し、他の成分との混合が容易でなくなる場合もある。このように、本発明における粉体に含有せしめるトランスグルタミナーゼ処理タンパク質において、加工特性、ハンドリング性を重視する場合には、トランスグルタミナーゼの種類、被処理タンパク質の種類に毎に好ましい処理条件があると考えられるが、当業者であれば、それぞれの対象粉体に適する処理条件を選定することは容易である。

【0027】さらに、トランスグルタミナーゼ未処理で前記水分値差が5重量%未満のタンパク質でもトランスグルタミナーゼ処理後に前記水分値差が5重量%を超えるものであれば、加工特性、ハンドリング性を重視する場合には、他の成分と混合中、混合後或いは造粒、乾燥により粉体の状態にした後にトランスグルタミナーゼが作用するようにせしめる方法も利用可能である。

【0028】

【実施例】以下に、本発明を実施例に基づいて説明するが、本発明はこれらにより限定されるものではない。

【0029】実施例1

小麦澱粉の平衡水分（水分値A）の測定：前記水分値Aの測定方法に従い、25℃で過飽和水蒸気を1.6リットル/分で送り込んでいるデシケーター中に、予め糊化した後、凍結乾燥した小麦澱粉の粗粉碎物を置いた場合の、澱粉の水分含量増加の経時変化を測定した。尚、小麦澱粉は、その結果を図1に示したが、約20時間で小麦澱粉は平衡水分、すなわち19.8重量%に達していることがわかる。小麦澱粉固有の水分値Aは19.8重量%であった。

【0030】実施例2

小麦澱粉のガラス転移水分（水分値B）測定：前記水分値Bの測定方法に従い、予め糊化した後、凍結乾燥した小麦澱粉を種々の水分値に吸湿せしめた試料を、銀製容器に密封した後、各々のガラス転移温度をDSC（セイコー電子工業（株）製品、以下同様）にて測定した結果を図2に示す。図から、水分上昇に従い小麦澱粉のガラス転移温度は低下し、水が小麦澱粉の可塑剤として働いていることが分かる。また、その各測定点を結ぶ図中の曲線から、25℃における小麦澱粉のガラス状態からラバー状態に変わる水分値は20.1重量%であると推定される。従って、小麦澱粉固有の水分値Bは20.1重量%であった。

【0031】以上、実施例1、2の結果から小麦澱粉の水分値B－水分値Aは0.3重量%であることがわかり、本発明にて好ましいと規定している5重量%には満たない成分であることがわかる。

【0032】実施例3

各種多糖類、タンパク質類の固有の水分値A、B測定結果：実施例1、2と同様の方法にて、数百種類の多糖類、タンパク質類の固有の水分値A、水分値Bを測定した。尚、固有の水分値Aに関しては、測定場所の湿度、飽和水蒸気の製造機器及びデシケーターの形状により数重量%程度本発明における測定値と異なる場合が考えられるが、その場合には各測定場所において、測定を行う成分の固有の水分値Aと小麦澱粉の固有の水分値Aとの差を求め、本発明における小麦澱粉の固有の水分値A測定結果である19.8重量%にその差を足し引きすれば、本発明でいう各成分固有の水分値Aとはかい離しない値が得られる。

【0033】測定を行った成分のうち、代表的な物質の測定結果を表1に示した。表から分かるように、各種寒天、数種のカラギーナン、筋肉タンパク質、血清アルブミン、血清グロブリン、数種の架橋澱粉、ジアルデヒドスターチ、ツェイン、エラスチン、カードラン、トランスグルタミナーゼ処理カゼイン等が水分値B－水分値Aが高い値を示した。これらに比べ、粉体の主構成成分としてよく用いられる実施例1、2にて測定した小麦澱粉及びその分解物であるデキストリンの水分値B－水分値Aは低い値となっていた。また、架橋澱粉、カラギーナン

には低い値のものもあり、カゼインもトランスグルタミナーゼ処理（反応条件：80U/g・カゼイン、pH=7.5、40℃）を施す前は低値であった。また、大量にパン粉に混ぜた場合、吸湿に伴う軟化を抑える効果があるという報告（特開平2-2313号公報）がある熱凝固性タンパク質で、中でも最も好ましいとされているグルテンの水分値B－水分値Aは-2.8重量%と低い値であり、十分な効果は得られないと考えられる。

【0034】実施例4

10 パン粉食感での評価（1）：実施例3の中で固有の水分値B－水分値Aが高いと認められた物質を粉体に含有せしめた場合、実際に粉体の吸湿に伴う劣化が抑えられるのかどうかを評価するため、固有の水分値B－水分値Aが高い物質として寒天をパン粉に含有せしめ、寒天の吸湿に伴う食感劣化の抑制効果を評価、検討した。

【0035】予め加熱溶解せしめた低ゼリー強度の寒天（伊那食品工業（株）製品、ウルトラ寒天AX-30）を、ゲル化しない程度に熱い状態のまま乾重量当たり10重量%となるよう小麦薄力粉、卵、食塩、砂糖、牛乳、ベーキングパウダーと共に混練した後、蒸し器中で膨化させた。これを急速に凍結した後、乾燥、粉碎することにより寒天入りパン粉を調製した。また、寒天を添加しない対照品も寒天添加重量部を小麦薄力粉に置き換え、同様に調製した。

【0036】上記方法にて調製した2種のパン粉の食感（クリスピー感）を、評価パネル数20名により5点満点で官能評価した。尚、クリスピー感を感じるギリギリの食感を3点とするよう予めパネルには伝えた。結果を図3に示す。

30 【0037】図3より、両パン粉とも水分含量の上昇に伴いクリスピー感が減少しているが、寒天を添加したパン粉の方が無添加のパン粉より全水分域で高いクリスピー感を示していた。その結果、図3よりクリスピー感を感じる限界である3点を示す水分含量を求めると、寒天添加パン粉は約15.5重量%、無添加のパン粉は約13.5重量%と、クリスピー感を感じる限界の水分含量に約2重量%の差が認められた。従って、寒天を10重量%含有せしめることにより、約2重量%余分に吸湿しても同様の食感を維持できることを認めた。

40 【0038】食品の流通に最もよく用いられる温度域は-20～35℃であるが、この温度域でパン粉を相対湿度75重量%～100重量%以下に保存した場合の平衡水分はおおよそ12～15.5重量%の範囲にあるが、本発明の寒天添加パン粉は、15.5重量%までもクリスピー感が維持できる。従って、こうした温度、湿度条件下で保存され、平衡状態まで吸湿が進んでもパン粉のクリスピー感をさらに維持できる可能性を示している。以上より、固有の水分値BとAとの差が大きい成分を含む粉体は、吸湿に伴う劣化が抑止されることが確認された。

【0039】実施例5

パン粉食感での評価(2): 実施例4に引き続き、実施例3のなかで固有の水分値B-水分値Aが高いと認められた架橋澱粉(松谷化学(株)製品、フードスターチF-1)をパン粉に含有せしめ、吸湿に伴う食感劣化の抑制効果を評価、検討した。架橋澱粉が乾重量当たり30重量%となるよう小麦強力粉、食塩、砂糖、インスタント酵母、水とを混練したドウを、一、二次発酵の後、250℃オーブン中で焼成しパンを調製した。このパンを一晩冷蔵庫(約4℃)で老化、乾燥した後、粉碎することにより架橋澱粉入りパン粉を調製した。また、架橋澱粉を添加しない対照品、及びグルテン入り品についても、架橋澱粉添加重量部を各々小麦強力粉、グルテン(和光純薬(株)製品、小麦由来)に置き換え、同様に調製した。

【0040】上記方法にて調製した3種のパン粉の食感(クリスピー感)を、評価パネル数20名により5点満点で実施例4と同様の方法にて官能評価した。結果を図4に示す。

【0041】図4より、各パン粉とも水分含量の上昇に伴いクリスピー感が減少しているが、架橋澱粉を添加したパン粉の方が無添加及びグルテン添加パン粉より全水分域で高いクリスピー感を示していた。その結果、図4よりクリスピー感を感じる限界である3点を示す水分含量を求めると、架橋澱粉添加パン粉は約14.5重量%、無添加及びグルテン添加パン粉は約12.5重量%と、クリスピー感を感じる限界の水分含量に約2重量%の差が認められた。

【0042】従って、固有の水分値BとAの差が5重量%を超える架橋澱粉を、粉体であるパン粉に30重量%含有せしめることにより、約2重量%余分に吸湿しても同様の食感を維持できることを認めた。一方、実施例3の中でも述べたように、大量にパン粉に混ぜた場合、吸湿に伴う軟化を抑える効果があるという報告(特開平2-2313号公報)がある熱凝固性タンパク質で、中でも最も好ましいとされているグルテンは水分値B-水分値Aは-2.8重量%と低いため、この報告のようにパン粉に含有せしめても効果がないと予想されたが、図4

に示すグルテン添加パン粉食感の水分含量依存性は無添加のパン粉と差がないことから、予想通りグルテン添加は有効でなかった。

【0043】以上より固有の水分値BとAとの差が5重量%を超える成分を含有せしめることにより、製法が異なっても吸湿に伴う劣化が抑制できることを認められると共に、この水分値の差が低い成分を含有せしめても吸湿に伴う劣化が抑制できないことを認めた。

【0044】実施例6

10 粉末調味料での評価: アミノ酸や塩を多く含む粉末調味料は、該記の通り吸湿に伴う劣化が著しいことから、粉末醤油により本発明の有効性評価を行った。寒天添加粉末醤油はデキストリン(松谷化学(株)製品、パインデックス#2)18重量部、濃口醤油10重量部、水30重量部を溶解混合した後、予め2重量部分の寒天(伊那食品工業(株)製品、UP)を40重量部の温水にて溶解したものと混合したものを凍結乾燥することにより調製した。また、寒天無添加粉末醤油はデキストリン(松谷化学(株)製品、パインデックス#2)20重量部、濃口醤油10重量部、水30重量部を溶解混合した後、

20 予め加熱しておいた40重量部の温水を加えたものを凍結乾燥することにより調製した。

【0045】調製した2種の粉末醤油を各々5個の秤量瓶に分けた後、25℃、相対湿度79重量%の条件で保存し、粉物性、褐変度を比較した。結果を表2に示すが、12時間保存後寒天無添加醤油は吸湿に伴う固結が、24時間後にはさらに吸湿が進むことによる液状化が、5つの試料の何れでも認められたのに比べ、寒天添加品は24時間保存で5試料中1個に吸湿による固結が認められたに過ぎず、さらに72時間まで保存しても液状化した試料は1つも無かった。従って、寒天の添加された粉末は吸湿に伴う品質劣化を大幅に改善できた。以上から、固有の水分値BとAとの差が5重量%を超える成分を含有せしめることにより、粉体の組成が異なっても吸湿に伴う劣化が抑制できることを認めた。

【0046】

【表1】

物 質 名	水分値 A (%)	水分値 B (%)	水分値 B-A(%)
寒天1 (純正化学、Agar粉末)	25.1	>50.0	>24.9
寒天2 (伊那食品工業、S-6)	27.5	>50.0	>22.5
寒天3 (伊那食品工業、UP-16)	25.2	>40.0	>14.8
寒天4 (伊那食品工業、AX-30)	29.7	>40.0	>10.3
カゼイン(コメンダ・ベチン 製、I-4945)	24.9	33.5	8.6
筋肉繊維質 (牛モモ肉より調製)	30.3	>40.0	> 9.7
牛血清アルブミン (和光純薬)	20.0	33.0	13.0
牛血清 α -グロブリン (和光純薬)	19.1	26.0	6.9
ツェイン (東京化成、コーン由来)	16.3	32.0	15.7
エラスチン(ナカハシ、牛首由来)	15.2	26.0	10.8
トランスグルタミナーゼ処理 α -カゼイン	34.0	40.0	6.0
カードラン (武田薬品工業)	23.1	32.0	8.9
架橋澱粉1 (松谷化学、7-フスチ F-1)	21.7	30.0	8.3
ジアルデヒドスターチ (Sigma 製)	11.6	21.0	9.4
小麦澱粉 (和光純薬)	19.8	20.1	0.3
カゼイン(コメンダ・ベチン 製、I-0910)	29.9	27.0	- 2.9
架橋澱粉2 (王子コンスターチ、有機酸系)	21.0	18.2	- 2.8
デストリン1 (松谷化学、パンデックス #1 透析品)	24.5	18.2	- 6.3
デストリン2 (松谷化学、パンデックス TK16 透析品)	20.5	17.1	- 3.4
酸ゼラチン (ニッピ、S-00131)	26.8	21.1	- 5.7
小麦グルテン (和光純薬製)	15.8	13.0	- 2.8
α -カゼイン (Sigma 製)	33.7	15.5	-18.2

【0047】

* * 【表2】

	12時間後		24時間後	
	固 結	液状化	固 結	液状化
寒天無添加粉末醤油	5/5	0/5	5/5	5/5
寒天添加粉末醤油	0/5	0/5	1/5	0/5

【0048】

【発明の効果】以上、詳述したように、本発明によれば吸湿による軟化や固結、場合によっては液状化まで進行して品質が変化する粉体に対して、前記した固有の水分値Aより水分値Bが5重量%以上高い成分を添加することにより、該粉体の吸湿による品質劣化を効果的に抑制することができる上、特に食品においては、調理あるいは加工が施された後も、本来の味、風味、食感等に大き

な影響を及ぼすことなく、吸湿による品質劣化の抑制された粉末食品を提供することを可能としたものである。

【図面の簡単な説明】

【図1】小麦澱粉の水分値Aの測定結果を示す図。

【図2】小麦澱粉の水分値Bの測定結果を示す図。

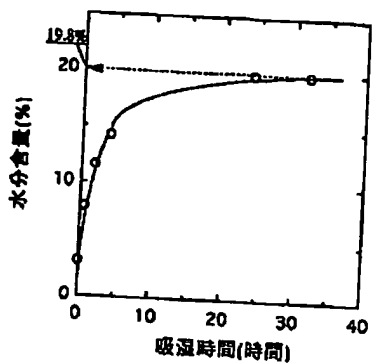
【図3】寒天添加及び無添加パン粉の食感の水分依存性を示す図。

【図4】架橋澱粉添加、グルテン添加及び無添加パン粉

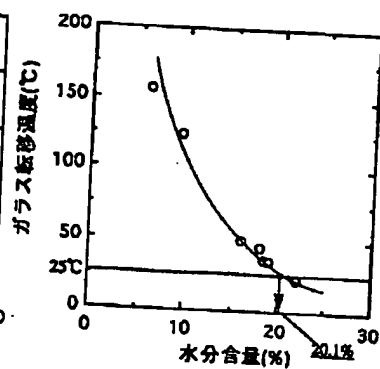
(8)

の食感の水分依存性を示す図。

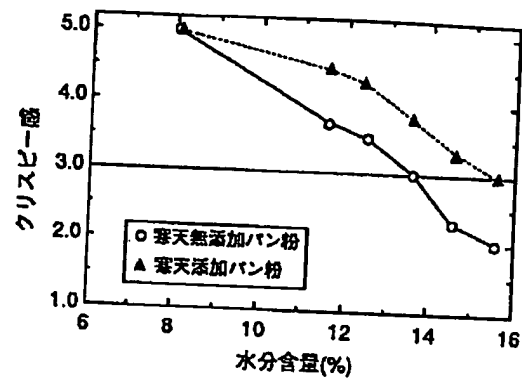
【図1】



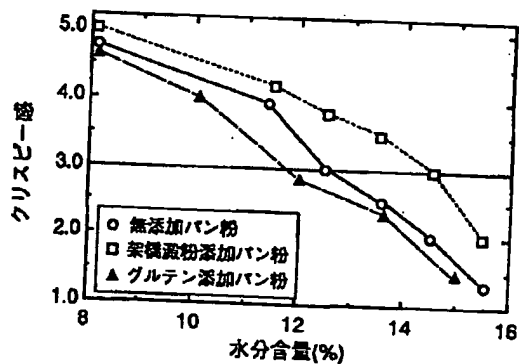
【図2】



【図3】



【図4】



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(54) POWDER

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a powder effectively prevented from deteriorating in quality as a result of moisture absorption or subsequent aggregation by adding a specific amount of an ingredient having a specific moisture content which is higher by at least a specific value (%) than an intrinsic moisture content.

SOLUTION: This powder contains 3-90wt.%, on a dry basis, ingredient (a) a moisture content B (glass transition moisture content at 25° C) higher by at least 5wt.% than an intrinsic moisture content A (equilibrium moisture content measured at 25° C in a supersaturated water vapor

atmosphere). It is regulated so as to have a moisture content lower than 40wt.% based on the wet weight. Thus, the powder can be effectively prevented from being deteriorated in quality by moisture absorption, i.e., from suffering softening, aggregation, or liquefaction all caused by moisture absorption. Examples of the powder include foods such as breadcrumbs and a powdery soy sauce. Examples of the ingredient contained include various agars, several carrageenans, blood albumin, and several crosslinked starches.

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[Claim(s)]

[Claim 1] Fine particles characterized by for the moisture value B (glass transition moisture in 25 degrees C) containing a component high 5% of the weight or more in 90 or less % of the weight 3 % of the weight [per dry weight] or more of the range, and containing a moisture content still smaller than 40 % of the weight per wet weight from the moisture value A of a proper (equilibrium moisture in 25 degrees C and a supersaturation steam ambient atmosphere).

[Claim 2] Fine particles according to claim 1 whose fine particles are bread crumbs and/or a bread-crumbs Mr. object.

[Claim 3] Fine particles according to claim 1 in which fine particles contain one or more kinds of amino acid, peptides, and/or those salts.

[Claim 4] Fine particles according to claim 1 which are the powder seasonings with which fine particles contain one or more kinds of amino acid, peptides, and/or those salts.

[Claim 5] Fine particles according to claim 1, 2, 3, or 4 whose component high 5% of the weight or

more is one or more kinds as which said moisture value B is chosen from from from said moisture value A among an agar, a carrageenan, animal muscular protein, blood albumin, a blood globulin, bridge formation starch, zein, and transglutaminase processing protein.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the fine particles which have improved moisture absorption or the property in which quality changes with subsequent caking.

[0002]

[Description of the Prior Art] A powder product is widely seen in fields, such as food and a fine chemical, and the quality change by their absorbing moisture poses a big problem in each industry which should be conquered. For example, a powder seasoning causes degradation of physical-properties change of a fluidity, a soluble fall, etc., the color by advance of oxidation, a browning reaction, etc., the taste, and flavor further while it arises with solid one according to moisture absorption and causes appearance change, such as softening, contraction, and caking, after that. Moreover, powder becomes soft according to moisture absorption also about a physiological active substance, and viscous description comes to be shown, consequently the remarkable activity fall by advance of oxidation, browning, a reaction of degeneration, etc. takes place. Thus, moisture absorption of fine particles brings about deterioration of large commodity value.

[0003] On the other hand, especially, a chemical change does not take place, but ** also poses a problem, admiration is snappily lost according to moisture absorption, and degradation by moisture absorption spoils commodity value for bread crumbs, powdered snack confectionery, etc.

[0004] In order to conquer such a problem, the approach of refrigerating and carrying out frozen preservation besides the approach of packing with a steam impermeable wrapping material conventionally etc. had been used, but when returning [in the case of the package approach] to ordinary temperature by opening again in the case of refrigeration and the freezing method, since effectiveness was lost, naturally in addition to a land use regulation occurring, problems, such as an increase of cost, had it. Moreover, the attempt suppressed by the approach of making polysaccharides, such as sodium salt (for example, JP,2-211833,A) of the approach of making protein, such as the approach (for example, JP,52-130932,A) and soybean protein (for example, JP,56-11771,A) which make fine particles containing an oil or a surfactant, and thermal coagulation nature protein (for example, JP,2-2313,A), contain, konnyaku powder (for example, JP,62-74255,A), a cellulose (for example, JP,63-245649,A), and a carboxymethyl cellulose, contain etc. has also been made. However, in order to acquire sufficient effectiveness and to make an additive contain so much with dozens of % of the weight although degradation by moisture absorption can be controlled, if any case of an approach is compared with additive-free, a remarkable change is caused to the original taste, flavor, and mouthfeel, or solubility may be reduced, there is still a problem in utilization, and it has not become sufficient solution.

[0005] The theory of the glass transition of the amorphous amorphous substance studied for years in the field of synthetic macromolecule in such a situation The research applied to food and a

biopolymer progresses, for example, softening accompanying moisture absorption of the powder of amorphism nature, such as starch and a dextrin. It is a change of state from the vitreous state which is an elastic viscoelastic body by the effectiveness as a plasticizer of water over these macromolecules to the rubber condition which is the viscous-like viscoelastic body. It is ** that various degradation reactions start by this change etc. (For example, report: J. Agric. Food Chem. of report: CRC Crit. Rev. Food Sci. Nutr. of Slade, L. and others, Vol. 30, p. 115, Karmas, R. and others, Vol. 40, and p. 873).

[0006] Moreover, the thing of Cookie for which after fixed moisture absorption processing can maintain admiration snappily has been reported by paying one's attention to a rise of the glass transition moisture in the same temperature which rises with the rise of the glass transition temperature of the whole solid-state (for example, report: J. Sci. Food Agric. of Slade, L. and others, Vol. 63, p. 133). This is Couchman-Karasz. As it is in a formula (it indicates to report: Carbohydr. Polym. of Kalichevsky, M. T. and others, Vol. 19, and p. 271), although the glass transition point of multicomponent mixture applied percentage to the glass transition temperature of each component, it is supposed that it is decided by total, and it is due to the glass transition point of the whole solid-state being got to make more higher components of a glass transition point contain. However, this was the approach of reducing a shoe cross with a glass transition temperature lower than wheat flour etc. by the accessory constituent from the wheat flour which is a principal component rather than adding the high matter of glass transition, and when big effectiveness was not expectable, the applicable product range was also narrow [this]. It is by carrying out and solution of the problem by addition of only the component with a glass transition temperature higher than the starch related substance which is the maximum constituent of wheat flour since the report of a sharply high edible component does not have glass transition temperature to current is [**** or] **.

[0007]

[Problem(s) to be Solved by the Invention] For the purpose of upgrading of the fine particles from which quality changes with moisture absorption or subsequent caking, also according to moisture absorption, there is no effect in the color, the taste, flavor, mouthfeel, etc., and this invention aims at offering the fine particles by which the debasement accompanying moisture absorption was controlled.

[0008]

[Means for Solving the Problem] As a result of repeating examination wholeheartedly that the above-mentioned technical problem should be solved, even if glass transition temperature is a high component, this invention persons. It finds out that sufficient effectiveness of preventing the bad influence which originates in moisture absorption when fine particles are made containing will not be acquired if the equilibrium moisture in some fixed water-vapor-pressure conditions is not a low component. The more the moisture value B (glass transition moisture) was still higher than the moisture value A (equilibrium moisture in a supersaturation steam ambient atmosphere) of the proper in a room temperature (25 degrees C), when fine particles were made to contain the more, the effectiveness which prevents softening by moisture absorption found out the large thing.

[0009] Then, as a result of the moisture value B-moisture value's A screening a high component out of hundreds of kinds of polysaccharide, and protein, various agars, several sorts of carrageenans, muscular protein, blood albumin, a blood globulin, several sorts of bridge formation starch, dialdehyde starch, zein, an elastin, curdlan, several sorts of transglutaminase processing protein, etc. found out that a high value was shown. Furthermore, when fine particles were made to actually contain these components in 90 or less % of the weight 3 % of the weight [per dry weight] or more of the range, when there is less the moisture than 40 % of the weight, it checks that the above-mentioned technical problem is solvable, and came to complete this invention.

[0010] It consists in the fine particles characterized by for the moisture value B (glass transition moisture in 25 degrees C) containing a component high 5% of the weight or more in 90 or less % of the weight 3 % of the weight [per dry weight] or more of the range, and containing a moisture content still smaller than 40 % of the weight per wet weight the first of this invention from the moisture value A of a proper (equilibrium moisture in 25 degrees C and a supersaturation steam ambient atmosphere).

[0011] The second consists in the fine particles of a publication in the first place [of this invention whose fine particles of the invention in this application are bread crumbs and/or a bread-crumbs Mr. object]. The third consists in the fine particles of a publication in the first place [of this invention in which the fine particles of the invention in this application contain one or more kinds of amino acid, peptides, and/or those salts]. The fourth consists in the fine particles of a publication in the first place [of this invention which is the powder seasoning with which the fine particles of the invention in this application contain one or more kinds of amino acid, peptides, and/or those salts]. The fifth of the invention in this application consists in the fine particles of the first of said this invention said whose moisture value B is one or more kinds as which a component high 5% of the weight or more is chosen from among an agar, a carrageenan, animal muscular protein, blood albumin, a blood globulin, bridge formation starch, zein, and transglutaminase processing protein - the fourth publication from said moisture value A.

[0012]

[Embodiment of the Invention] In this invention, with the moisture value A of the proper of the component added to fine particles The about 10-% of the weight solution of each component or the coarse-grinding object after freeze drying of suspension is placed into the desiccator which is the thing of the equilibrium moisture in 25 degrees C and a supersaturation steam ambient atmosphere, and is sending in the supersaturation steam by part for 1.6l./at 25 degrees C. It takes out in the place where weight reached the balance in extent which exceeded for 20 hours, and asks for the presentation ratio (% of the weight) of the moisture called for from the weight change in the weight before and after 105 degrees C dried for 20 hours.

[0013] With moreover, the moisture value B of the proper of the component added to fine particles in this invention Are the thing of the glass transition moisture in 25 degrees C, and said freeze-drying coarse-grinding object of each component is absorbed moisture to various moisture values using a steam. After preparing, it is the moisture value (% of the weight) which changes to a rubber condition from the vitreous state of each component in 25 degrees C which creates the graph

of moisture dependence of glass transition temperature, and is called for from the curve from the result of having measured each glass transition temperature with the differential scanning calorimeter (following, DSC). In addition, since it was circulated by circulation of fine particles and it was generally kept in ordinary temperature in many cases, the moisture value A and the moisture value B were set as the value of 25 degrees C for considering as the index of whether to absorb moisture and to be easy to deteriorate in this condition.

[0014] In this invention, a desirable component has the moisture value B larger than the moisture value A of the component proper. It does, and the value of effectiveness to which the amyllum tritici well used as a main constituent of fine particles and the dextrin which is that decomposition product lengthened the moisture value A from the moisture value B of that proper is low if the moisture value difference of an addition component is close to this range, since [-15 % of the weight or more and 1% of the weight or less of] the moisture value difference is small. So, the component which has 5% of the weight or more of a difference as moisture weight % is desirable, and it is so still more desirable that it is large if this difference is large.

[0015] Although it will not be limited as concrete matter especially if the moisture value B is higher than the moisture value A 5% of the weight or more, it is desirable that it is an edible component and various agars, several sorts of carrageenans, muscular protein, blood albumin, a blood globulin, several sorts of bridge formation starch, dialdehyde starch, zein, an elastin, curdlan, several sorts of transglutaminase processing protein, etc. are desirable. However, the various agars which are water solubility among these since the effectiveness of being hard to make uniform matrix structure in many cases, and pulling up the glass transition point of other components is missing when it kneads with other amorphous coexistence components of a water-soluble low component, several sorts of carrageenans, muscular protein, blood albumin, a blood globulin, several sorts of bridge formation starch, several sorts of especially transglutaminase processing protein, etc. are desirable. Moreover, even if it makes these contain independently respectively, it may combine with other components, you may make it contain, and especially combination is not limited, either.

[0016] If the content ratio of a component high 5% of the weight or more has too few moisture values B, effectiveness is low, and if many [too], in order to cause a remarkable change to mouthfeel of powder product original, flavor, and a fluidity, it is more desirable than the moisture value A of a proper included in fine particles in this invention to contain in 90 or less % of the weight 3 % of the weight [per dry weight] or more of the range. Still more preferably, although it changes with the effectiveness of the component made to contain, properties of the powder product which it is going to improve, etc., a content ratio can be easily set up, if it is this contractor.

[0017] In this invention, the moisture contained in powder is 40 or less % of the weight as wet weight. When it exceeds 40 % of the weight, as for the addition effectiveness of a component high 5% of the weight or more, it is more desirable than the moisture value A of a proper that it is the moisture not more than this since the moisture value B stops clarifying.

[0018] Especially the fine particles in this invention are not limited, and both the food grade containing a saccharide besides the powder seasoning from which quality changes with the bread crumbs from which quality changes with moisture absorption, its prototype, moisture absorption, or

subsequent caking, powdered juice, powdered soup, instant coffee, and powdered dairy products, salts, organic acids or the salt of those, amino acid or the salt of those, a peptide, one or more sorts of protein, etc. the object for physic the object for feed and chemicals pharmaceutical preparation are included. Moreover, fine particles may not change effectiveness a lot with the particle size and a configuration, may be the particle size of arbitration, and a configuration, and further, since they are not greatly influenced by the method of drying for disintegration, and the granulating method, they may be obtained by the manufacture approach of arbitration. Moreover, the fine particles in this invention also contain the fine particles by which said moisture value difference was covered with the large component.

[0019] Especially if the moisture value B of a proper is 5 % of the weight or more, it is not limited, and the agar which is the desirable component which can be used in this invention has it irrespective of the class of the class of algae of the main raw material, an extraction method, a purification method, and approach. [all more nearly available than the moisture value A] Although what has various properties by the raw material and the process is known by the agar, the agar as an addition component to the fine particles in this invention has so large that the jelly strength of an agar is generally high the difference of the moisture values A and B of a proper, and the effectiveness per unit weight at the time of making fine particles contain is in a high inclination. The agar with high jelly strength has the difficulty that viscosity is high and that a working characteristic and handling nature are bad, by one side. Therefore, when thinking a handling property and a working characteristic as important, as for the agar of low jelly strength, what chemical modification, such as a thing decomposed into low-molecular with the acid or the enzyme or sulfation, was given may be desirable.

[0020] For example, when preparing the dough for manufacturing the bread crumbs which made the agar contain, in the agar of high jelly strength, the prepared dough may not fully swell by fermentation the top for which whose viscosity is high and mixing with wheat flour is not easy. However, if the agar of low jelly strength is used, although the effectiveness per unit addition will become low a little, preparation of the dough equipped with the good property is easy. Thus, although it is thought that there is a class of desirable agar for every fine particles made to contain in the case of an agar, if it is this contractor, it is easy to select the class of agar which has the property to be suitable for each object fine-particles food.

[0021] Especially if the moisture value B of a proper is 5 % of the weight or more, it is not limited, and the carrageenan which can be used for this invention has it irrespective of the class of the class of algae of the main raw material, an extraction method, a purification method, and approach, and the class of salt. [all more nearly available than the moisture value A]

[0022] Especially if the moisture value B of a proper is 5 % of the weight or more from the moisture value A, it is not limited, and as for the animal muscular protein which can be used for this invention, any muscular protein of an animal is contained from invertebrates, such as crustacean, to vertebrates, such as fishes and the mammals. Moreover, if it is within the limits of this, the preparation approach of the muscular protein for use and a purification degree will not influence the existence of effectiveness.

[0023] Especially if the moisture value B of a proper is 5 % of the weight or more from the moisture value A, it is not limited, and as for the blood albumin and the blood globulin which are used for this invention, anything of an animal is contained from invertebrates, such as crustacean, to vertebrates, such as fishes and the mammals. moreover, if it is within the limits of this, the blood albumin for use, the preparation approach of each blood globulin, and a purification degree will not influence the existence of the addition effectiveness to fine particles.

[0024] Especially if the moisture value B of a proper is 5 % of the weight or more from the moisture value A, it is not limited, and it is included for anything of a starch raw material, and, as for the bridge formation starch which can be used for this invention, the bridge formation art for improvement in this moisture value difference is not limited, either.

[0025] Especially if the moisture value B of a proper is 5 % of the weight or more, it is not limited, and the zein which can be used for this invention has it irrespective of the class of the class of corn of the main raw material, an extraction method, a purification method, and approach. [all more nearly available than the moisture value A]

[0026] The moisture value B of a proper will not be limited especially if the transglutaminase processing protein which can be used for this invention is 5 % of the weight or more from the moisture value A. Especially processing conditions, such as a class of the enzyme concentration in the case of carrying out transglutaminase processing of the class of protein which carries out transglutaminase processing, and the protein, a proteinic condition, reaction time, and concomitant, are not limited whenever [origin / of transglutaminase /, preparation approach and purification], either. However, when the crosslinking reaction of the protein by transglutaminase advances too much, protein is insolubilized, and also when mixing with other components becomes less easy, there is. Thus, in the transglutaminase processing protein the fine particles in this invention are made to contain, when thinking a working characteristic and handling nature as important, it is thought that desirable processing conditions are in the class of transglutaminase and the class of processed protein at **, but if it is this contractor, it is easy to select the processing conditions suitable for each object fine particles.

[0027] furthermore, transglutaminase — it is unsettled, and if said moisture value difference exceeds 5 % of the weight, when said moisture value difference will think a working characteristic and handling nature as important, after it changes even less than 5% of the weight of protein into the condition of fine particles by granulation under mixing with other components, and after mixing, and desiccation after transglutaminase processing, the approach transglutaminase makes it make it act is also available.

[0028]

[Example] This invention is not limited by these although this invention is explained below based on an example.

[0029] Measurement of the equilibrium moisture (moisture value A) of example 1 amylum tritici: Aging of the increment in a moisture content of starch at the time of placing the freeze-dried coarse-grinding object of amylum tritici into the desiccator which is sending in the supersaturation steam by part for 1.6l./at 25 degrees C according to the measuring method of said moisture value A,

after becoming a paste beforehand was measured. In addition, although amylum tritici showed the result to drawing 1, it turns out that amylum tritici has reached equilibrium moisture, i.e., 19.8 % of the weight, in about 20 hours. The moisture value A of an amylum-tritici proper was 19.8 % of the weight.

[0030] glass transition moisture (moisture value B) measurement [of example 2 amylum tritici]: — after sealing the sample which made the freeze-dried amylum tritici absorb moisture to various moisture values after becoming a paste beforehand according to the measuring method of said moisture value B in a silver container, the result of having measured each glass transition temperature in DSC (the SEIKO Electronic industry product and the following — the same) is shown in drawing 2. As for the glass transition temperature of amylum tritici, drawing shows that fall and water is working as a plasticizer of amylum tritici according to a moisture rise. Moreover, it is presumed from the curve in drawing with which each of that point of measurement is contracted that the moisture value which changes to a rubber condition from the vitreous state of the amylum tritici in 25 degrees C is 20.1 % of the weight. Therefore, the moisture value B of an amylum-tritici proper was 20.1 % of the weight.

[0031] As mentioned above, as for the moisture value B-moisture value A of amylum tritici, the result of examples 1 and 2 shows that it is 0.3 % of the weight, and it turns out that it is the component which is not filled to 5% of the weight it is prescribed by this invention that is desirable.

[0032] The moisture value A, B measurement result of a proper of example 3 various polysaccharide and protein: The moisture value A of the proper of hundreds of kinds of polysaccharide and protein and the moisture value B were measured by the same approach as examples 1 and 2. In addition, although the case where it differs from the measured value in this invention about several% of the weight with the humidity of a measurement location, the manufacture device of saturated steam, and the configuration of a desiccator can be considered about the moisture value A of a proper In that case, if the difference of the moisture value A of the proper of a component and the moisture value A of the proper of amylum tritici which measure is searched for in each measurement location and the difference is added, lengthened and carried out to 19.8% of the weight which it is as a result of [of the proper of the amylum tritici in this invention] moisture value A measurement The value which does not deviate is acquired with the moisture value A of each component proper as used in the field of this invention.

[0033] The measurement result of the typical matter was shown in Table 1 among the components which measured. As shown in a table, the moisture value B-moisture value A showed [various agars, several sorts of carrageenans, muscular protein, serum albumin, serum globulin, several sorts of bridge formation starch, dialdehyde starch zein, an elastin curdlan, transglutaminase processing casein, etc.] the high value. Compared with these, the moisture value B-moisture value A of the dextrin which are the amylum tritici measured in the examples 1 and 2 well used as main ***** of fine particles and its decomposition product had turned into a low value. Moreover, there was also a thing of a low value in bridge formation starch and a carrageenan, and casein was also a low value before ***** about transglutaminase processing (reaction condition: 80 U/g - casein, pH=7.5, 40 degrees C). Moreover, when bread crumbs are mixed in large quantities, it is -2.8 % of the weight

of moisture value B-moisture values of the gluten made the most desirable especially in the thermal coagulation nature protein in which a report (JP,2-2313,A) of being effective in suppressing softening accompanying moisture absorption is, and a value with low A, and it is thought that sufficient effectiveness is not acquired.

[0034] Evaluation by example 4 bread-crumbs mouthfeel (1): When the moisture value B-moisture value A of a proper makes fine particles contain the matter accepted to be high in an example 3, in order to evaluate whether it is that degradation accompanying moisture absorption of fine particles is actually suppressed, the moisture value B-moisture value A of a proper made bread crumbs contain an agar as high matter, and evaluated and examined the depressor effect of mouthfeel degradation accompanying moisture absorption of an agar.

[0035] After kneading the agar (the Ina Food-stuff-industry product, ultra agar AX- 30) of low jelly strength which carries out the heating dissolution beforehand with wheat weak flour, an egg, salt, sugar, cow's milk, and baking powder so that it may become 10 % of the weight per dry weight with a condition hot to extent which is not gelled, it was made to plump in a steamer. After freezing this quickly, the bread crumbs containing an agar were prepared by drying and grinding. Moreover, the contrast article which does not add an agar also transposed the agar addition weight section to wheat weak flour, and prepared it similarly.

[0036] Organic-functions evaluation of mouthfeel (crispy feeling) of two sorts of bread crumbs prepared by the above-mentioned approach was carried out by five-point full marks with 20 evaluation panel numbers. In addition, it was beforehand told to the panel that last-minute mouthfeel which senses a crispy feeling considered as three points. A result is shown in drawing 3 .

[0037] From drawing 3 , the crispy feeling in a total moisture region with the bread crumbs more expensive than additive-free bread crumbs with which both bread crumbs added the agar although the crispy feeling was decreasing with the rise of a moisture content was shown. Consequently, when the moisture content which shows three points which are the limitations of sensing a crispy feeling from drawing 3 was calculated, about 2% of the weight of the difference was accepted in the moisture content of the limitation that sense agar addition bread crumbs about 15.5% of the weight, and additive-free bread crumbs sense a crispy feeling as about 13.5 % of the weight. Therefore, by making an agar contain 10% of the weight, even if it absorbed moisture in the excess about 2% of the weight, it admitted that same mouthfeel was maintainable.

[0038] Although the equilibrium moisture at the time of saving [in this temperature region] bread crumbs at 75 % of the weight - 100 or less % of the weight of relative humidity although the temperature region best used for circulation of food was -20-35 degrees C is in 12 - 15.5% of the weight of the range about, the agar addition bread crumbs of this invention can maintain a crispy feeling to 15.5 % of the weight. Therefore, it is saved under such temperature and humidity conditions, and although moisture absorption progresses to equilibrium, possibility that the crispy feeling of bread crumbs will be further maintainable is shown. As mentioned above, it was checked that degradation accompanying moisture absorption in the fine particles in which a difference with the moisture values B and A of a proper contains a large component is inhibited.

[0039] Evaluation by example 5 bread-crumbs mouthfeel (2): It continued at the example 4, and in

the example 3, the moisture value B-moisture value A of a proper made bread crumbs contain the bridge formation starch (the Matsutani Chemistry product, hood starch F-1) accepted to be high, and evaluated and examined the depressor effect of mouthfeel degradation accompanying moisture absorption. The dough which kneaded wheat strong flour, salt, sugar, instant yeast, and water so that bridge formation starch might become 30 % of the weight per dry weight was calcinated in 250-degree-C oven after 1 and secondary fermentation, and the pan was prepared. After aging and drying this pan in a refrigerator (about 4 degrees C) overnight, the bread crumbs containing bridge formation starch were prepared by grinding. Moreover, about the contrast article which does not add bridge formation starch, and the elegance containing gluten, the bridge formation starch addition weight section was respectively transposed to wheat strong flour and gluten (the Wako Pure Chem product, wheat origin), and was prepared similarly.

[0040] Organic-functions evaluation of mouthfeel (crispy feeling) of three sorts of bread crumbs prepared by the above-mentioned approach was carried out by the same approach as an example 4 by five-point full marks with 20 evaluation panel numbers. A result is shown in drawing 4 .

[0041] From drawing 4 , the crispy feeling in a total moisture region with the bread crumbs more expensive than additive-free and gluten addition bread crumbs with which each bread crumbs added bridge formation starch although the crispy feeling was decreasing with the rise of a moisture content was shown. Consequently, when the moisture content which shows three points which are the limitations of sensing a crispy feeling from drawing 4 was calculated, as for bridge formation starch addition bread crumbs, about 2% of the weight of the difference was accepted in the moisture content of the limitation that additive-free and gluten addition bread crumbs sense a crispy feeling as about 12.5 % of the weight, about 14.5% of the weight.

[0042] Therefore, by making the bread crumbs which are fine particles contain the bridge formation starch for which the difference of the moisture values B and A of a proper exceeds 5 % of the weight 30% of the weight, even if it absorbed moisture in the excess about 2% of the weight, it admitted that same mouthfeel was maintainable. In the thermal coagulation nature protein in which a report (JP,2-2313,A) that on the other hand it is effective in suppressing softening accompanying moisture absorption when bread crumbs are mixed in large quantities, as stated also in the example 3 is Although it was expected that it was ineffective even if it made bread crumbs contain it like this report, since A of the gluten made the most desirable especially was low, -2.8 % of the weight of moisture value B-moisture values Since the moisture content dependency of gluten addition bread-crumbs mouthfeel shown in drawing 4 did not have additive-free bread crumbs and an additive-free difference, gluten addition was not effective as expected.

[0043] As mentioned above, even if processes differed by making the component for which a difference with the moisture values B and A of a proper exceeds 5 % of the weight contain, while being able to admit that degradation accompanying moisture absorption could be controlled, it was admitted that degradation accompanying moisture absorption could not be controlled even if the difference of this moisture value makes a low component contain.

[0044] Evaluation with an example 6 powder seasoning: Since degradation accompanying moisture absorption was remarkable as the account of this, the powder seasoning containing many amino

acid or salts performed effectiveness evaluation of this invention by powdered soy sauce. After agar addition powdered soy sauce carried out dissolution mixing of the dextrin (Matsutani Chemistry product, pineapple DEKKUSU #2) 18 weight section, the soy sauce 10 weight section, and the water 30 weight section, it was prepared by freeze-drying beforehand what dissolved the agar (the Ina Food-stuff-industry product, UP) of the amount part of duplexs with the warm water of 40 weight sections, and the mixed thing. Moreover, after agar additive-free powdered soy sauce carried out dissolution mixing of the dextrin (Matsutani Chemistry product, pineapple DEKKUSU #2) 20 weight section, the soy sauce 10 weight section, and the water 30 weight section, it was prepared by freeze-drying what added the warm water of 40 weight sections heated beforehand.

[0045] After dividing respectively two sorts of prepared powdered soy sauce into five weighing bottles, it saved on 25 degrees C and the conditions of 79 % of the weight of relative humidity, and whenever [powder physical-properties and browning] was measured. The sample which liquefied even if caking according [an agar addition article] to moisture absorption to one piece the inside of 5 samples by 24-hour preservation compared with liquefaction by moisture absorption progressing [caking accompanying / although a result is shown in Table 2 / moisture absorption in the agar additive-free soy sauce after 12 hour preservation] further 24 hours after having been accepted by all of five samples did not pass to have accepted but having been saved till 72 more hours did not have one. Therefore, the powder with which the agar was added has improved quality degradation accompanying moisture absorption sharply. As mentioned above, by making the component for which a difference with the moisture values B and A of a proper exceeds 5 % of the weight contain, even if the presentations of fine particles differed, it was admitted that degradation accompanying moisture absorption could be controlled.

[0046]

[Table 1]

表1

物 質 名	水分値 A (%)	水分値 B (%)	水分値 B-A(%)
寒天1 (純正化学、Agar粉末)	25.1	>50.0	>24.9
寒天2 (伊那食品工業、S-6)	27.5	>50.0	>22.5
寒天3 (伊那食品工業、UP-16)	25.2	>40.0	>14.8
寒天4 (伊那食品工業、AX-30)	29.7	>40.0	>10.3
カゼイン(コペンハーゲン・バクシ 製、X-4945)	24.9	33.5	8.6
筋肉中の質 (牛モモ肉より調製)	30.3	>40.0	> 9.7
牛血清アルブミン (和光純薬)	20.0	33.0	13.0
牛血清 α -グロブリン (和光純薬)	19.1	26.0	6.9
ツェイン (東京化成、コーン由来)	16.3	32.0	15.7
エスチン(ナカハシ、牛首由来)	15.2	26.0	10.8
トランスグルタミナーゼ 処理 α -カゼイン	34.0	40.0	6.0
カードラン (武田薬品工業)	23.1	32.0	8.9
架橋澱粉1 (松谷化学、7-フラスチ F-1)	21.7	30.0	8.3
ジアルデヒドスターチ (Sigma 製)	11.6	21.0	9.4
小麦澱粉 (和光純薬)	19.8	20.1	0.3
カゼイン(コペンハーゲン・バクシ 製、X-0910)	20.9	27.0	- 2.9
架橋澱粉2 (王子コンスターチ、有機酸系)	21.0	18.2	- 2.8
ネストリン1 (松谷化学、パンデックス #1 透析品)	24.5	18.2	- 6.3
ネストリン2 (松谷化学、パンデックス TK16 透析品)	20.5	17.1	- 3.4
酸ゼラチン (ニッピ、S-00131)	26.8	21.1	- 5.7
小麦グルテン (和光純薬製)	15.8	13.0	- 2.8
α -カゼイン (Sigma 製)	33.7	15.5	-18.2

[0047]

[Table 2]

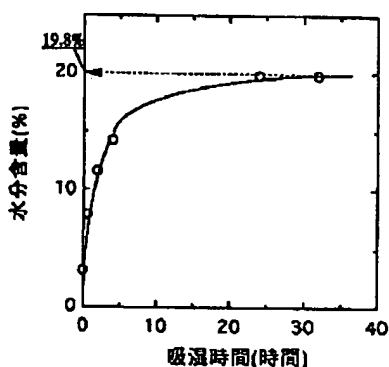
	1 2 時間後		2 4 時間後	
	固 結	液状化	固 結	液状化
寒天無添加粉末醤油	5 / 5	0 / 5	5 / 5	5 / 5
寒天添加粉末醤油	0 / 5	0 / 5	1 / 5	0 / 5

[0048]

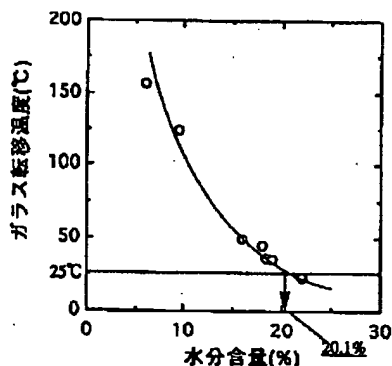
[Effect of the Invention] As mentioned above, to softening by moisture absorption, union, and the fine particles from which it goes on to liquefaction depending on the case, and quality changes, as explained in full detail, when the moisture value B adds a component high 5% of the weight or more from the above mentioned moisture value A of a proper, according to this invention In food when quality degradation by moisture absorption of these fine particles can be controlled effectively, it makes it possible to offer the powdered food with which quality degradation by moisture absorption was controlled, without having big effect on the original taste, flavor, mouthfeel, etc., even after cooking or processing is performed.

DRAWINGS

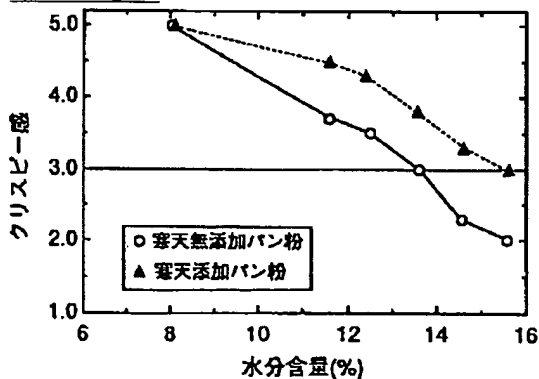
[Drawing 1]



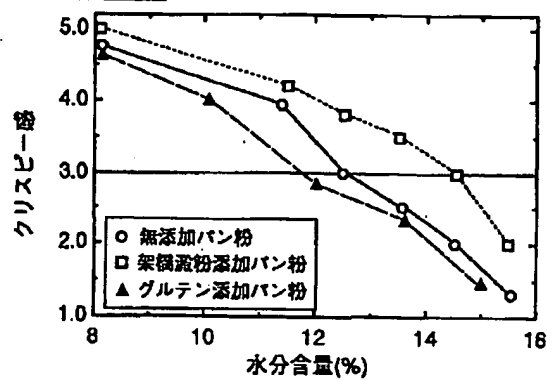
[Drawing 2]



[Drawing 3]



[Drawing 4]



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